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(71) Applicant: **Wintec Holding ApS**
7330 Brande (DK)

(72) Inventor: **BACH, Jens Oliver**
7330 Brande (DK)

(74) Representative: **Larsen & Birkeholm A/S**
Banegaardspladsen 1
1570 Copenhagen V (DK)

(54) MODULAR PRE-FABRICATED WATER CONTROL PUMP SYSTEM

(57) The present invention relates a pre-fabricated water control pump system (100) comprising a first (110) and a second module (120). The first module (110) comprises a first frame (200) with two side panels (210); a base panel (220) interconnecting the two side panels (210); a front panel (230) comprising a grate (232) adapted for retaining waterborne residues; and at least one lifting anchor (240) or coupler adapted for receiving a lifting anchor. The second module (120) comprises a second frame (300) with two side panels (310); a base panel (320) interconnecting the two side panels (310); at least one lifting anchor (330) or coupler adapted for receiving a lifting anchor; and pump means (340).

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Description

Technical field of the invention

[0001] The present invention relates to water control pump systems.

Background of the invention

[0002] Water control pump systems are used for a variety of infrastructure systems, such as the supply of water to canals, the drainage of low-lying land, and the removal of sewage to processing sites.
The frame/foundation of the water control pump system is cast directly at the application site. Hence, the construction time is long, as the cement or other castable material needs to settle and harden before e.g. the pump member can be installed therein. The hardening of the cement or other castable material may be affected by the weather conditions, resulting in a frame/foundation of poor quality and strength. Furthermore, the frame/foundation is susceptible to undermining of the water.
[0003] It is therefore desirable to provide a system, which can eliminate some or all of the above problems.

Summary of the invention

[0004] One aspect relates to a modular pre-fabricated water control pump system comprising:

a) A first module comprising a first frame comprising:

i. two side panels;
ii. a base panel interconnecting the two side panels;
iii. a front panel comprising a grate adapted for retaining waterborne residues; and
iv. at least one lifting anchor or coupler adapted for receiving a lifting anchor; and

b) A second module comprising a second frame comprising:

i. two side panels; and
ii. a base panel interconnecting the two side panels;
iii. at least one lifting anchor or coupler adapted for receiving a lifting anchor; and
iv. pump means.

[0005] In one or more embodiments, the modular pre-fabricated water control pump system further comprises a third module comprising:

a. a third frame comprising:

i. two side panels; and
ii. a base panel interconnecting the two side panels;
iii. at least one lifting anchor or coupler adapted for receiving a lifting anchor;

b. one or more sluice gate members; and
c. an actuator adapted for moving the one or more sluice gate members;

wherein the side and/or base panels are adapted for mounting the one or more sluice gate members thereto.
[0006] The third module may be an integrated part of the first and/or second modules.
[0007] It may be an advantage to have the modules made separately for ease of transportation.
[0008] In one or more embodiments, the modular pre-fabricated water control pump system further comprises means for measuring the water level in front of and/or behind the grate and/or the sluice gate member.
[0009] In one or more embodiments, the modular pre-fabricated water control pump system further comprises means for measuring the water level in close proximity to the grate and/or the sluice gate member.
[0010] In one or more embodiments, the modular pre-fabricated water control pump system further comprises means for measuring the water level of a body of water in liquid communication with said system.
[0011] In one or more embodiments, the modular pre-fabricated water control pump system further comprises means for controlling the position of the sluice gate member and the activity of the pump means in response to the water level in close proximity to the grate and/or the sluice gate member. As an example, if the water level downstream to the modular pre-fabricated water control pump system is indicated to exceed a predefined threshold, the means for controlling the position of the sluice gate member and the activity of the pump means closes the sluice gate and activates the pump means. Thereby, the water level may be lowered downstream to the modular pre-fabricated water control pump system, while preventing further water to reach it from the upstream side. The pump means may pump the water back upstream, or to a reservoir - depending on the water level situation upstream to the modular pre-fabricated water control pump system.
[0012] In one or more embodiments, the modular pre-fabricated water control pump system further comprises means for controlling the position of the sluice gate member and the activity of the pump means in response to the water level of a body of water in liquid communication with said system. This configuration will allow for a faster response to a rising water level.
[0013] The term "modular" is used herein with regard to a structure that is constructed on the basis of a standard pattern or dimensions, and is easily expanded or joined with other like structures.
[0014] The term "pre-fabricated" as used throughout this application, means the opposite of fabricated in situ. In other words, the frame is finished as finished structures

when shipped to a builder or customer, rather than being poured into temporary forms at the building site or place of use.

[0015] In the present context, the term "lifting anchor" should be broadly construed to encompass any such device for lifting the frame with or without grate and/or pump means installed therein. Alternatively, a coupler adapted for receiving a lifting anchor is embedded in the first and/or second frame. The coupler may comprise internal or external threading, depending on the configuration of the lifting anchor.

[0016] In one or more embodiments, the lifting anchor or coupler adapted for receiving a lifting anchor is mechanically tied into the reinforcing members embedded in the castable material, such as concrete.

[0017] The first and/or the second and/or the third frame may also be made of metal or a castable material. It is to be understood that any suitable castable material, such as cement, mortar, concrete, ceramics, thermoset plastics, and thermoplastics can be used for producing the first frame.

[0018] In one or more embodiments, the side and/or base panels are made from a reinforced castable material.

[0019] In one or more embodiments, the side and/or base panels are made from a reinforced castable material, and wherein the reinforcement extends beyond the side and/or base panels.

[0020] As used herein, the term "reinforced castable material" refers to a castable material into which reinforcement bars or fibres have been cast to carry tensile loads in order to strengthen a structure that would otherwise be brittle.

In one or more embodiments, the first and/or the second frame is a pre-cast reinforced concrete frame.

[0021] The first and/or the second and/or the third frame may also be made of metal or a castable material. It is to be understood that any suitable castable material, such as cement, mortar, concrete, ceramics, thermoset plastics, and thermoplastics can be used for producing the first and/or the frame.

[0022] The term "pre-cast" as used throughout this application means the opposite of cast in situ. In other words, the pre-cast reinforced concrete frame is finished as finished structures when shipped to a builder or customer, rather than being poured into temporary forms at the building site or place of use.

[0023] As used herein, the term "reinforced concrete" refers to concrete into which reinforcement bars or fibres have been cast to carry tensile loads in order to strengthen a structure that would otherwise be brittle.

[0024] In one or more embodiments, the lifting anchor or coupler adapted for receiving a lifting anchor is mechanically tied into the reinforcing members embedded in the concrete.

[0025] In order to avoid that water will undermine the base panel of the first and/or second and/or third module; it may be an advantage to extend the base panels beyond the side panels, preferably beyond the front, back and outer side/face of the side panel. In one or more embodiments, the base panel of the first and/or second and/or third module extends beyond the side panels.

[0026] In one or more embodiments, the base panel of the first and/or second and/or third module extends beyond the front of the side panels.

[0027] In one or more embodiments, the base panel of the first and/or second and/or third module extends beyond back of the side panels.

[0028] In one or more embodiments, the base panel of the first and/or second and/or third module extends beyond the outer side/face of the side panels.

[0029] In one or more embodiments, the base panel of the first and/or second and/or third module extends beyond the front and/or the back and/or the outer side of the side panels.

[0030] In one or more embodiments, the part of the base panel of the first and/or second and/or third module extending beyond the side panels comprises channels adapted for receiving an earth anchor.

[0031] In one or more embodiments, the reinforcement extends beyond the side and/or base panels of the first and/or second and/or third module.

[0032] In one or more embodiments, the reinforcement extends beyond the side panels of the first and/or second and/or third module, preferably beyond the front and back of the side panel. This will allow the pre-fabricated water control pump system to be built into other reinforced concrete structures.

[0033] In one or more embodiments, the reinforcement extends beyond the front of the side panels of the first and/or second and/or third module.

[0034] In one or more embodiments, the reinforcement extends beyond the back of the side panels of the first and/or second and/or third module.

[0035] In one or more embodiments, the reinforcement extends beyond the outer side/face of the side panels of the first and/or second and/or third module.

[0036] In one or more embodiments, the reinforcement extends beyond the front and/or the back and/or the outer side of the side panels of the first and/or second and/or third module.

[0037] In one or more embodiments, the pre-fabricated water control pump system further comprises means for delivering water and/or compressed air.

[0038] In one or more embodiments, the base panel of the first module comprises suction channels adapted to be connected to a source of suction. With or without the function of the air/water channels, the suction channels may be used to remove sediments blocking the function of the grate.

[0039] In one or more embodiments, the base panel of the third module comprises suction channels adapted to be connected to a source of suction. With or without the function of the air/water channels, the suction channels may be used to remove sediments blocking the function of the one or more sluice gate members.

[0040] In one or more embodiments, the outer face of the side panels of the first and/or second and/or third module each comprise a channel configured for receiving a reinforcement plate adapted for being imbedded in the adjacent dam section.

[0041] In one or more embodiments, the pre-fabricated water control pump system further comprises a casing adapted for receiving the first and/or second and/or third module, the casing comprising two side panels and a base panel, wherein the base panel is adapted for supporting the base panel of the first and/or the second frame, and wherein each side panel is adapted for supporting a side panel of the first and/or the second frame. This allows for a system, where the first and/or second and/or third module may be exchanged with a spare module during service.

[0042] In one or more embodiments, the casing comprises an opening between its side panels, such that water can flow to and from a first and/or second module according to the present invention positioned within the casing.

[0043] In one or more embodiments, the casing comprises a front panel with an opening, and wherein the opening is adapted such that water can flow to a first and/or second module positioned within the casing; and wherein the casing further comprises a back panel with an opening, and wherein the opening is adapted such that water can flow from a first and/or second module positioned within the casing.

[0044] In one or more embodiments, the casing comprises a front panel with an opening, and wherein the opening is adapted such that water can flow to a first and/or second and/or third module positioned within the casing.

[0045] In one or more embodiments, the casing comprises a back panel with an opening, and wherein the opening is adapted such that water can flow from a first and/or second and/or third module positioned within the casing.

[0046] In one or more embodiments, the casing is made of reinforced concrete. In one or more embodiments, the casing is pre-cast.

[0047] In one or more embodiments, the casing comprises at least one lifting anchor or coupler adapted for receiving a lifting anchor.

[0048] In order to avoid that water will undermine the base panel; it may be an advantage to extend the base panels beyond the side panels, preferably beyond the front, back and outer side/face of the side panel. In one or more embodiments, the base panel extends beyond the side panels.

[0049] In one or more embodiments, the base panel of the casing extends beyond the front of the side panels.

[0050] In one or more embodiments, the base panel of the casing extends beyond the back of the side panels.

[0051] In one or more embodiments, the base panel of the casing extends beyond the outer side/face of the side panels.

[0052] In one or more embodiments, the base panel of the casing extends beyond the front and/or the back and/or the outer side of the side panels.

[0053] In one or more embodiments, the part of the base panel of the casing extending beyond the side panels comprises channels adapted for receiving an earth anchor.

[0054] In one or more embodiments, the reinforcement extends beyond the side panels of the casing, preferably beyond the front and back of the side panel. This will allow the system to be built into other reinforced structures.

[0055] In one or more embodiments, the reinforcement extends beyond the front of the side panels of the casing.

[0056] In one or more embodiments, the reinforcement extends beyond the back of the side panels of the casing.

[0057] In one or more embodiments, the reinforcement extends beyond the outer side/face of the side panels of the casing.

[0058] In one or more embodiments, the reinforcement extends beyond the front and/or the back and/or the outer side of the side panels of the casing.

[0059] In one or more embodiments, the outer face of the side panels each comprise a channel configured for receiving a reinforcement plate adapted for being imbedded in the adjacent dam section.

[0060] A second aspect relates to a module for use in a modular pre-fabricated water control pump system, the module comprising a first frame comprising:

i. two side panels;
ii. a base panel interconnecting the two side panels;
iii. a front panel comprising a grate adapted for retaining waterborne residues; and
iv. at least one lifting anchor or coupler adapted for receiving a lifting anchor.

[0061] In one or more embodiments, the base panel extends beyond the side panels, and wherein the part of the base panel extending beyond the side panels comprises channels adapted for receiving an earth anchor.

[0062] In one or more embodiments, the outer face of the side panels each comprise a channel configured for receiving a reinforcement plate adapted for being imbedded in the adjacent dam section.

[0063] A third aspect relates to a module for use in a modular pre-fabricated water control pump system, the module comprising a second frame comprising:

i. two side panels; and
ii. a base panel interconnecting the two side panels;
iii. at least one lifting anchor or coupler adapted for receiving a lifting anchor; and
iv. pump means.

[0064] It should be noted that embodiments and features described in the context of one of the aspects of the present invention also apply to the other aspects of

the invention.

Brief description of the figures

[0065]

Figure 1 shows a pre-fabricated water control pump system in accordance with various embodiments of the invention;

Figure 2 shows a cross-section through a pre-fabricated water control pump system in accordance with various embodiments of the invention;

Figure 3 shows a bird's eye view of a pre-fabricated water control pump system in accordance with various embodiments of the invention;

Figure 4 shows a third module with two sluice gate members (mitre gate) in accordance with various embodiments of the invention;

Figure 5 shows a third module with one sluice gate member (flap gate) in accordance with various embodiments of the invention;

Figure 6 shows a third module with one sluice gate member (vertical rising gate) in accordance with various embodiments of the invention; and

Figure 7 shows a casing adapted for receiving the pre-cast reinforced concrete frame in accordance with various embodiments of the invention.

Detailed description of the invention

[0066] Figure 1 shows a pre-fabricated water control pump system in accordance with various embodiments of the invention. The modular pre-fabricated water control pump system 100 comprises a first 110, a second 120, and a third 130 module. The first module 110 comprising a first frame comprising two side panels 210; a base panel 220 interconnecting the two side panels 210; a front panel 230 (Figure 2) comprising a grate 232 adapted for retaining waterborne residues; and a lifting anchor (not shown) or coupler adapted for receiving a lifting anchor.

The second module 120 comprises a second frame comprising two side panels 310; a base panel 320 (Figure 2) interconnecting the two side panels 310; a lifting anchor (not shown) or coupler adapted for receiving a lifting anchor; and pump means 340 (Figure 2).

The third module 130 comprises a third frame comprising two side panels 410; a base panel 420 interconnecting the two side panels 410; a lifting anchor 430 (Figures 4-7) or coupler adapted for receiving a lifting anchor; one or more sluice gate members 500; and an actuator 600 (Figures 4-7) adapted for moving the one or more sluice gate members. The side 410 and/or base 420 panels are adapted for mounting the one or more sluice gate members 500 thereto.

[0067] Figure 2 shows a cross-section through a pre-fabricated water control pump system in accordance with various embodiments of the invention.

[0068] Figure 3 shows a bird's eye view of a pre-fabricated water control pump system in accordance with various embodiments of the invention.

[0069] Figure 4 shows the third module 130 alone. The third module 130 comprises two sluice gate members (mitre gate). Figure 4A shows the sluice gate member 500 in a closed position, and a Figure 4B shows the sluice gate member in an open position. The third module 130 comprises a pre-cast reinforced concrete frame 400, lifting anchors 430, two sluice gate members 500, and an actuator 600 adapted for moving the sluice gate members 500.

[0070] The pre-cast reinforced concrete frame 400 comprises two pre-cast reinforced concrete side panels 410, and a pre-cast reinforced concrete base panel 420 interconnecting the two side panels 410. The side base panel 410 is adapted for mounting the sluice gate members 500 thereto.

[0071] The base panel 420 is shown extending beyond the outer side/face of the side panels 410. Large stones may be placed on this part to keep the pre-cast reinforced concrete frame 130 in place.

[0072] A part of the base panel 420 is configured as a lower sluice gate member 422 extending between the two side panels 410.

[0073] Figure 5 shows the third module 130 with one sluice gate member (flap gate) 500 in accordance with various embodiments of the invention.

Figure 5A shows the sluice gate member 500 in a closed position, and a Figure 5B shows the sluice gate member in an open position.

[0074] The pre-cast reinforced concrete base panel is configured as a lower sluice gate member 422 extending between the two side panels. The lower sluice gate member 422 comprises water/air channels 424 adapted to be connected to a source of water and/or compressed air. Water and/or compressed air may thereby be used to remove sediments blocking the function of the one or more sluice gate members.

[0075] Figure 6 shows the third module 130 with one sluice gate member (vertical rising gate) in accordance with various embodiments of the invention. Figures 6A (perspective view) and 6B (cross-sectional view) show the sluice gate member 500 in an open position, while Figure 6C (cross-sectional view) shows the sluice gate member in a closed position.

[0076] The pre-cast reinforced concrete base panel is configured as a lower sluice gate member 422 extending between the two side panels.

[0077] The inner side/face 412 of the side panels each comprise a channel 414 configured for receiving a moving sluice gate member 500.

[0078] Figure 7 shows a casing 700 adapted for re-

ceiving the pre-cast reinforced concrete frame 400 in accordance with various embodiments of the invention. Figure 7A shows the pre-cast reinforced concrete frame 400 about to be inserted into the casing 700, and Figure 7B shows the pre-cast reinforced concrete frame inserted into the casing.

[0079] The casing 700 comprises two side panels 710 and a base panel 720. The base panel 720 is adapted for supporting the base panel 420 of the pre-cast reinforced concrete frame 400, and each side panel 710 is adapted for supporting a side panel 410 of the pre-cast reinforced concrete frame 400.

[0080] The reinforcement 730 extends beyond the side panels 710 of the casing 700, here shown beyond the front, back and outer face of the side panel. This will allow the pre-fabricated sluice gate system to be built into other reinforced concrete structures.

[0081] The outer face of the side panels each comprise a channel 740 configured for receiving a reinforcement plate adapted for being imbedded in the adjacent dam section.

References

[0082]

100 Modular pre-fabricated water control pump system
110 First module
120 Second module
130 Third module
200 First frame
210 Side panel
220 Base panel
230 Front panel
232 Grate
240 Lifting anchor or coupler adapted for receiving a lifting anchor
300 Second frame
310 Side panel
320 Base panel
330 Lifting anchor or coupler adapted for receiving a lifting anchor
340 Pump means
400 Third frame
410 Side panel
412 Inner side/face of the side panel
414 Channel
420 Base panel
422 Lower sluice gate member
400 Lifting anchor or coupler adapted for receiving a lifting anchor
500 Sluice gate member
600 Actuator
700 Casing
710 Side panel
720 Base panel
730 Reinforcement
740 Channel

Claims

1. A modular pre-fabricated water control pump system (100) comprising:

a) A first module (110) comprising a first frame (200) comprising:

i. two side panels (210);
ii. a base panel (220) interconnecting the two side panels (210);
iii. a front panel (230) comprising a grate (232) adapted for retaining waterborne residues; and
iv. at least one lifting anchor (240) or coupler adapted for receiving a lifting anchor; and

b) A second module (120) comprising a second frame (300) comprising:

i. two side panels (310); and
ii. a base panel (320) interconnecting the two side panels (310);
iii. at least one lifting anchor (330) or coupler adapted for receiving a lifting anchor; and
iv. pump means (340).

2. The modular pre-fabricated water control pump system (100) according to claim 1, further comprising a third module (130) comprising:

a. a third frame (400) comprising:

i. two side panels (410); and
ii. a base panel (420) interconnecting the two side panels (410);
iii. at least one lifting anchor (430) or coupler adapted for receiving a lifting anchor;

b. one or more sluice gate members (500); and
c. an actuator (600) adapted for moving the one or more sluice gate members;

wherein the side (410) and/or base (420) panels are adapted for mounting the one or more sluice gate members (500) thereto.

3. The modular pre-fabricated water control pump system (100) according to any one of the claims 1-2, wherein at least a part of the side panel (310) of the second frame (300) is configured to be connected to at least a part of a side panel (210) of the first frame (200).

4. The modular pre-fabricated water control pump sys-

tem according to any one of the claims 1-3, further comprising means adapted for removing waterborne residues from the grate (232).

5. The modular pre-fabricated water control pump system according to claim 4, further comprising a conveyor belt, and wherein the means adapted for removing waterborne residues from the grate (232) are adapted to transport the waterborne residues from the grate and onto the conveyor belt.

6. The modular pre-fabricated water control pump system according to any one of the claims 1-5, wherein the base panel of the first and/or second and/or third module extends beyond the side panels (210).

7. The modular pre-fabricated water control pump system according to claim 6, wherein the part of the base panel (220) extending beyond the side panels (210) comprises channels adapted for receiving an earth anchor.

8. The modular pre-fabricated water control pump system according to any one of the claims 2-7, wherein the modular pre-fabricated water control pump system further comprises means for measuring the water level in close proximity to the grate and/or the sluice gate member.

9. The modular pre-fabricated water control pump system according to claim 8, wherein the modular pre-fabricated water control pump system further comprises means for controlling the position of the sluice gate member and the activity of the pump means in response to the water level in close proximity to the grate and/or the sluice gate member.

10. The modular pre-fabricated water control pump system according to any one of the claims 2-9, wherein modular pre-fabricated water control pump system further comprises means for measuring the water level of a body of water in liquid communication with said system.

11. The modular pre-fabricated water control pump system according to claim 10, wherein the modular pre-fabricated water control pump system further comprises means for controlling the position of the sluice gate member and the activity of the pump means in response to the water level of a body of water in liquid communication with said system.

12. A method for segregating a body of water into two distinct parts with a pre-fabricated water control pump system comprising the steps of:

- sinking a pre-fabricated pump system according to any one of the claims 1-11 at a predetermined location in the body of water, wherein the side panels of the first (200) and the second (300) frame having been chosen so as to have sufficient height to protrude above the water level of the body of water after the pre-fabricated water control pump system is sunk at its predetermined location; and
- building a dam up against the outer face of the side panels.

13. A module (110) for use in a modular pre-fabricated water control pump system according to any one of the claims 1-11 comprising a first frame (200) comprising:

i. two side panels (210);
ii. a base panel (220) interconnecting the two side panels (210);
iii. a front panel (230) comprising a grate (232) adapted for retaining waterborne residues; and
iv. at least one lifting anchor (240) or coupler adapted for receiving a lifting anchor.

14. A module (110) according to claim 13, further comprising a second frame (300) comprising:

i. two side panels (310); and
ii. a base panel (320) interconnecting the two side panels (310);
iii. at least one lifting anchor (330) or coupler adapted for receiving a lifting anchor; and
iv. pump means (340).

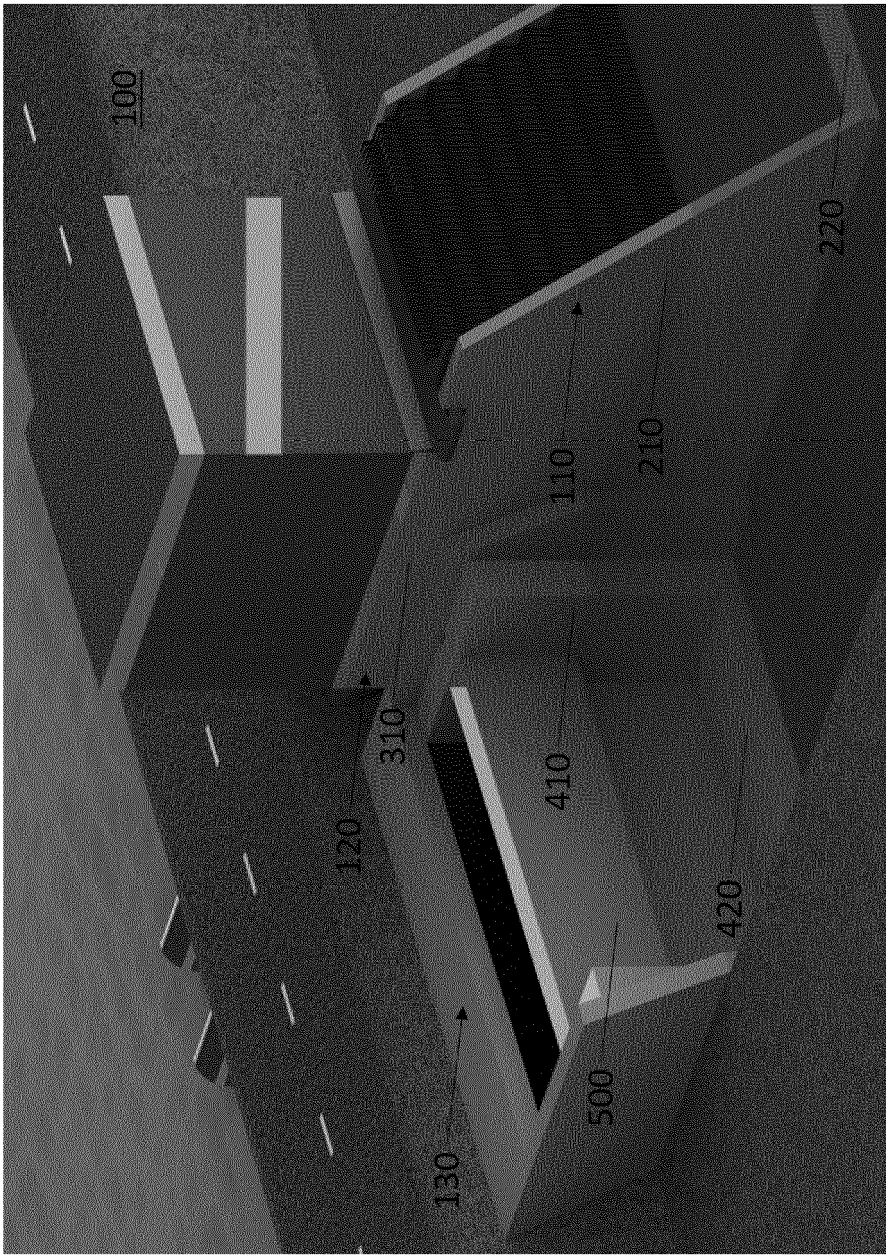


Fig. 1

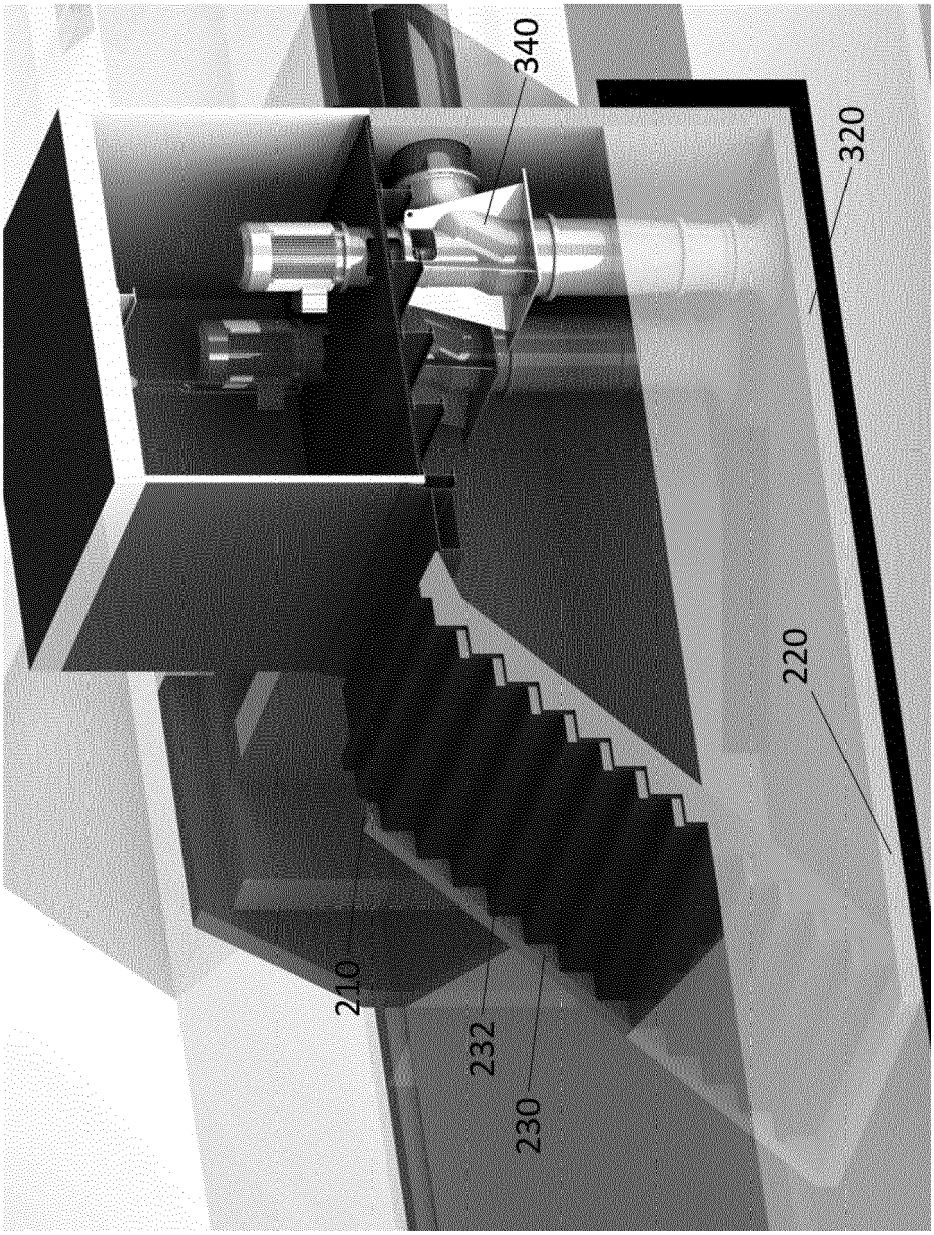


Fig. 2

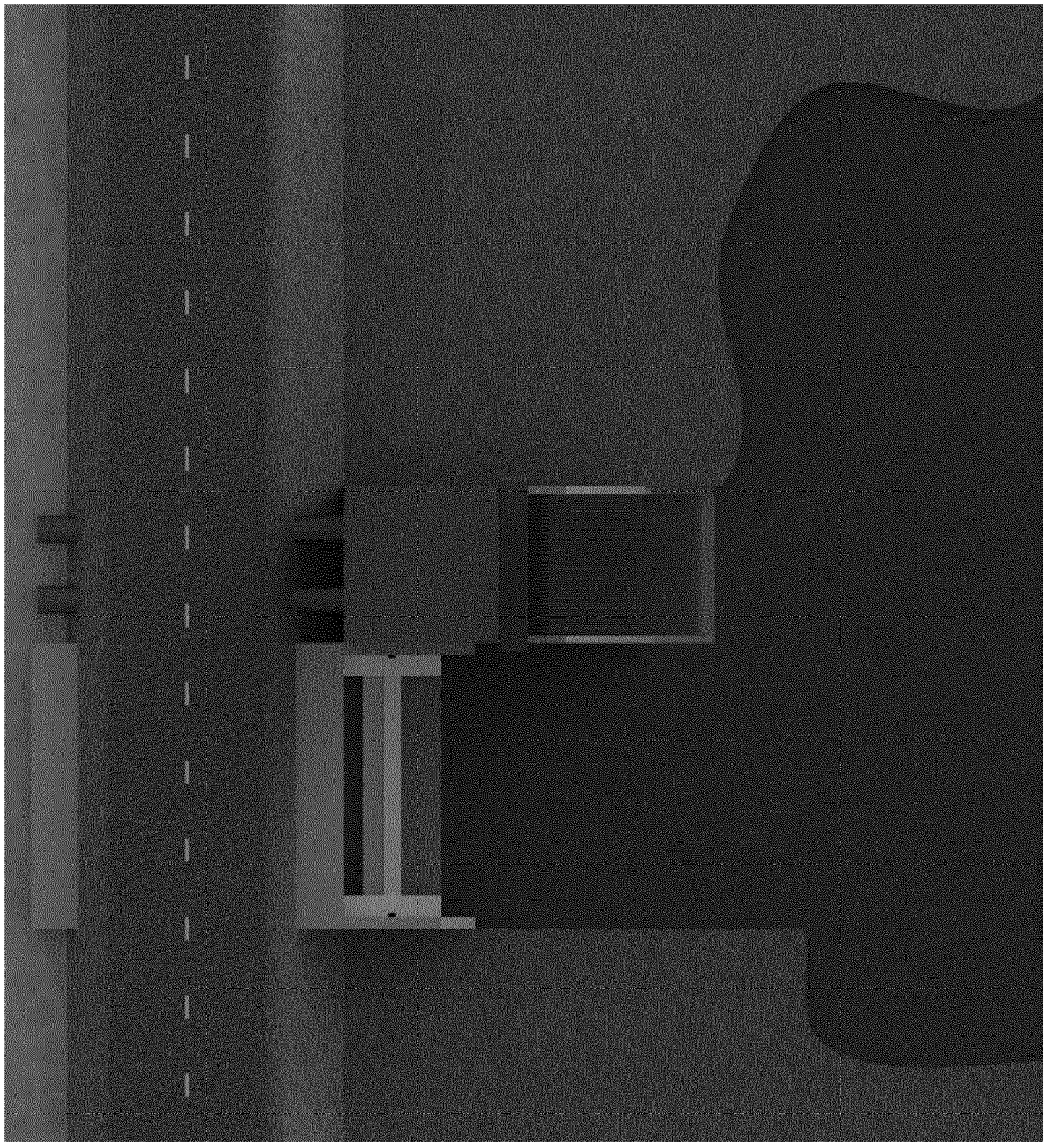


Fig. 3

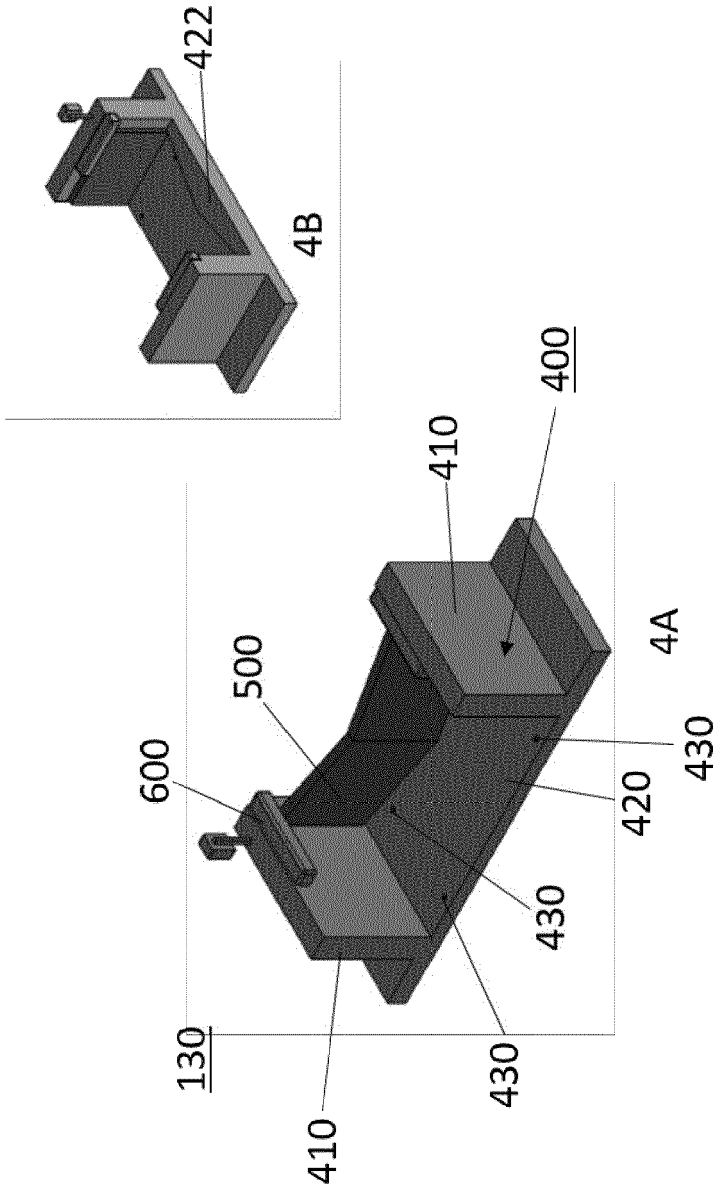
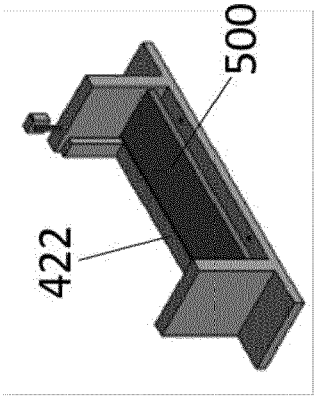


Fig. 4



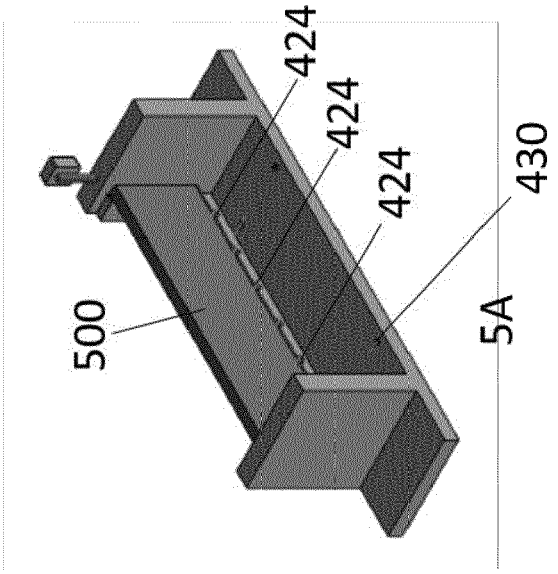


Fig. 5

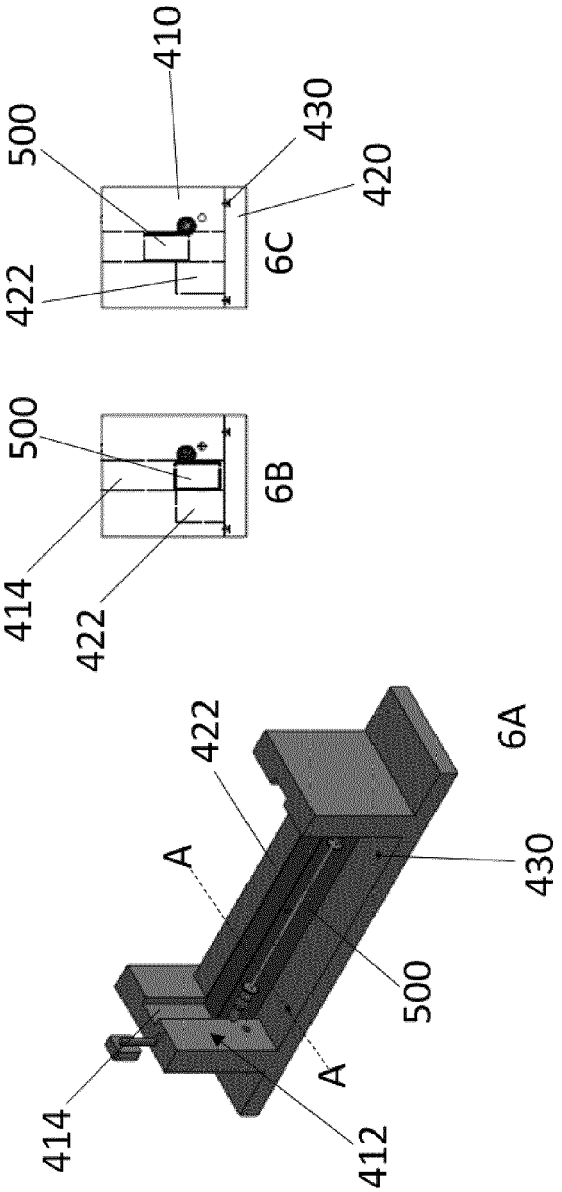


Fig. 6

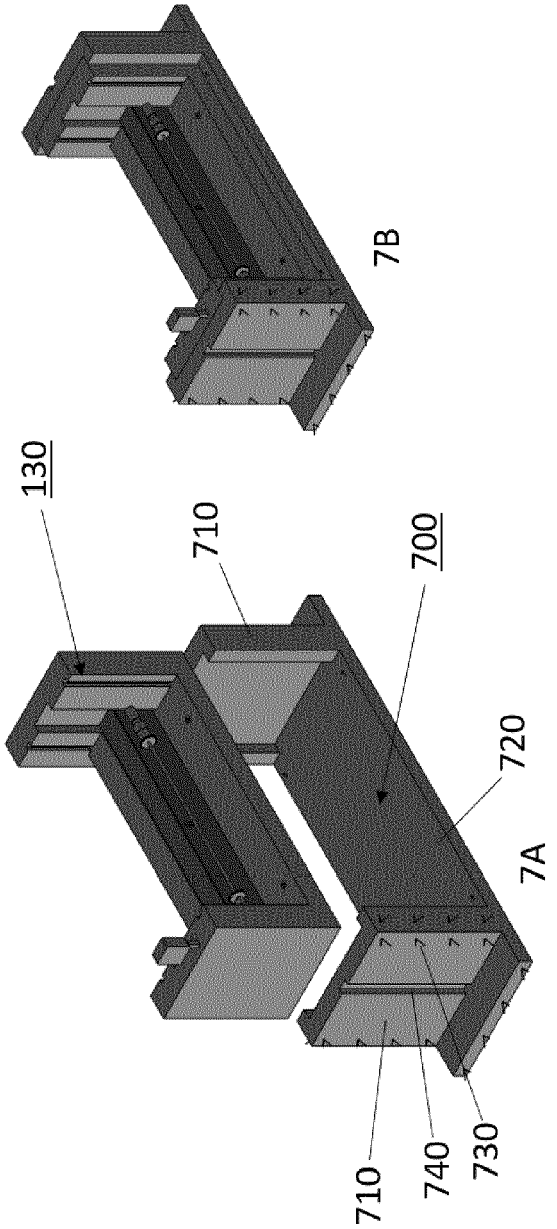


Fig. 7

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 3645

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 7 150 290 B1 (SMITH FRANK J [US]) 19 December 2006 (2006-12-19) * figures 4,5 * -----	1,3,4,6, 7,13,14	INV. E02B8/02 E02B3/10
X	WO 2015/161339 A1 (AQUAVEST PTY LTD [AU]) 29 October 2015 (2015-10-29) * page 25, line 31; figure 1 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

E02B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 August 2017	Flygare, Esa

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7150290 B1	19-12-2006	NONE	
WO 2015161339 A1	29-10-2015	NONE	

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